

## RESEARCH ARTICLES

# Low Impact Aerobic Exercise Has the Effect of Lowering Blood Pressure and Increasing Pulse in the Elderly at the Tresna Werdha Abdi Binjai Nursing Home

Dandi Dzaki Muzhaffar<sup>1</sup>, Robitah Asfur<sup>2</sup>

<sup>1</sup>Faculty of Medicine, Universitas Muhammadiyah Sumatera Utara, Jalan Gedung Arca No. 53, Medan 20217, Indonesia

<sup>2</sup>Department of Physiological Sciences, Faculty of Medicine, Universitas Muhammadiyah Sumatera Utara, Jalan Gedung Arca No. 53, Medan 20217, Indonesia

**Corresponding Email:** dzakidandi@gmail.com

**Abstract:** The prevalence of the elderly in Indonesia in 2020 is predicted to be more than 28 million people in the next two years. The elderly group is prone to the occurrence of high blood pressure. Increased blood pressure is a problem that can occur in *the event of ageing process*. Blood pressure and pulse can be controlled through healthy lifestyle changes, such as exercising. Based on this presentation, the researcher is interested in finding out whether there is an effect of low-impact aerobic exercise on blood pressure and pulse rate in the elderly. This research method is a *pre-experimental design with a one-group pretest-posttest design*. The design in this study was that there was only one group of interventions, or those who were given treatment. The measuring instrument used to measure is a sphygmomanometer. In the Wilcoxon test, systolic blood pressure was found to have a p value of 0.005, diastolic blood pressure was found to have a p value of 0.010, and pulse was found to have a p value of 0.000. In the Wilcoxon test, it is said to have an effect if the p-value: <0.05. It can be concluded that low-impact aerobic exercise can lower systolic blood pressure and diastolic blood pressure, and can raise the pulse rate of the elderly

**Keywords:** Low impact aerobics, pulse, elderly, exercise, blood pressure

## INTRODUCTION

Elderly, or abbreviated as elderly, is a person who has reached the age of more

than 60 years. The elderly are also grouped into someone who have been in the last stage of their life.<sup>1</sup> In this elderly age, they

will experience an event or events that are commonly called the *Ageing Process* or in Indonesian, it is also called the ageing process. The population in Indonesia in 2022 who are in the elderly phase, or the number of people who have entered the age of more than 60 years, is more than 7 per cent of the total population. This is expected to cause the elderly population to increase very quickly. This can happen due to a demographic change that is currently occurring in Indonesia, namely, the death rate is already at a low stage.<sup>2</sup>

The prevalence of the elderly in Indonesia in 2007 increased significantly; the elderly population in 2009 amounted to 18.96 million people and increased to 20.54 million people. The elderly population in 2020 in Indonesia is predicted to be more than 28 million people in the next two years; this figure causes Indonesia to be the country with the largest elderly population in the world. The number of elderly population in Indonesia in 2025 is predicted to increase to 33.69 million people and in 2035 it will increase to 48.19 million people<sup>3</sup> Based on information and data obtained from the Central Statistics Agency or BPS in 2020, six provinces with elderly populations were obtained, including West Sumatra, Yogyakarta, Central Java, East Java, Bali, and North Sulawesi. North Sulawesi Province occupies the top four positions in Indonesia, with the largest elderly population at 11.25%.<sup>4</sup>

Older age groups are prone to high blood pressure events. Increased blood

pressure is a problem that can occur in *the event of the ageing process*. This is also found in the Qur'an, namely Surah Yasin, verse 68, which means that whoever prolongs his life, we will undoubtedly reduce the blessings of life to him. High blood pressure must also be treated properly to prevent problems with other vital organs. Treating high blood pressure in the elderly can reduce morbidity and mortality rates from cardiovascular disease.<sup>5</sup>

Blood pressure levels and pulse rates can be controlled through behavioural changes, including avoiding smoking, eating healthy foods, exercising regularly, and avoiding alcohol. Physical activity can also be done in various ways; exercise is one of them. Exercise is not a treatment for high blood pressure, but it can be used as an additional treatment for people with high blood pressure. Exercise that can be done by the elderly is a leisurely walk, and aerobic gymnastics that affect the blood pressure and pulse of the elderly.<sup>5</sup>

Aerobic is a physical activity that uses oxygen in energy metabolism. *Low impact* is a type of aerobic exercise that can be done by the elderly. Low-impact aerobics is a good activity to do for the elderly, especially the elderly who experience high blood pressure, one of which as leisurely walking. Leisure walks are done by the elderly, namely with slow foot movements. This is easy to do and stay away from jumping movements, which are commonly called *low impact*.<sup>6</sup>

Experimental research on the effect of *low-impact* aerobic exercise on blood pressure and pulse in the elderly is still limited, especially in the elderly population living in nursing homes. The elderly in the orphanage environment have special characteristics, such as low levels of physical activity and the risk of degenerative diseases. Therefore, this study aims to directly test the effectiveness of low-impact aerobic exercise in lowering blood pressure and pulse frequency in the elderly group at the Tresna Werdha Abdi Binjai Nursing Home.

## METHOD

This study uses *a type of pre-experimental design* research with *a group pretest-posttest design*. The measuring instrument used to measure is a sphygmomanometer, done before and after being given a leisurely walk exercise.

The study will be conducted for 8 weeks with a duration of exercise ranging from 15-20 minutes as much as 3x/week, with a total of 24 leisure walking exercises.

The target population and sample in this study are all elderly people in the Tresna Werdha ABDI Binjai Nursing Home, based on inclusion and exclusion criteria.

### a) Inclusion criteria

1. The elderly who are in the Nursing Home, Tresna Werdha ABDI Binjai,
2. The elderly are willing to follow the whole research activities by signing an informed consent.
3. The elderly who are still able to carry

out daily activities.

### b) Exclusion criteria

1. The elderly who are no longer able to walk.
2. Elderly people who are suffering from joint and bone diseases, for example, osteoarthritis.
3. The elderly who have neurological disorders, such as stroke.
4. The elderly who have heart rhythm disorders.
5. The elderly who take anti-hypertensive drugs.

The last stage of the data will be calculated and analysed using SPSS to see if there is an effect of low-impact aerobic exercise activities on blood pressure and pulse levels in the elderly at the Tresna Werdha ABDI Binjai Nursing Home.

The data collected will be analysed using the *Wilcoxon rank sum test*. The data analysed is paired sample data, by comparing data before and after sports.

## RESULT

**Table 1: Distribution of Samples by Age**

Age	Sum	Presentase(%)
60-64	13	39,4
65-70	9	27,3
71-75	11	33,3

Table 1 shows the individual characteristics of research subjects based on age. The total number of respondents was 33 people, with details of respondents aged 60 - 64 years as many as 13 people, 65 - 70 years

old as many as 9 people, and 71 - 75 years old as many as 11 people.

**Table 2: Distribution of Samples by Sex**

Gender	Sum	Percentage (%)
Man	11	33,3
Woman	22	66,7

Table 2 shows the individual characteristics of the research subjects based on gender. The total number of respondents was 33 people, with 11 male respondents which were 11 people, and female sex was 22 female respondents.

**Table 3 Distribution of Samples Based on Systolic Blood Pressure of the Elderly Before and After the Intervention.**

Systolic blood pressure (mmHg)	Pretest	Post test
100-119	1	11
120-139	23	13
140-159	5	8
160-179	3	1
180-200	1	0

In Table 3, the systolic blood pressure of the elderly obtained before the intervention was 100-119 mmHg for 1 person, 120-139 mmHg for 23 people, 140-159 mmHg for 5 people, 160-179 mmHg for 3 people, and 180-200 mmHg for 1 person. After being given systolic blood pressure intervention of 100-119 mmHg for 11 people, 120-139 mmHg for 13 people, 140-159 mmHg for 8 people, and 160-179 mmHg which is 1 person.

**Table 4 Sample Distribution Based on Diastolic Blood Pressure of the Elderly Before and After the Intervention**

Diastolic blood pressure (mmHg)	Pretest	Post test
50-59	0	1

60-69	1	8
70-79	7	18
80-89	17	5
90-99	6	1
100-110	2	0

In Table 4, the diastolic blood pressure of the elderly was obtained before being given 60-69 mmHg intervention for 1 person, 70-79 mmHg for 7 people, 80-89 mmHg for 17 people, 90-99 mmHg for 6 people, and 100-110 mmHg for 2 people. Diastolic blood pressure of the elderly after being given an intervention of 50-59 mmHg for 1 person, 60-69 mmHg for 8 people, 70-79 mmHg for 18 people, 80-89 mmHg for 5 people, and 90-99 mmHg for 1 person.

**Table 5. Sample Distribution Based on Elderly Pulse Before and After Intervention**

Denyut nadi (x/menit)	Pretest	Post test
50-69	4	0
70-89	25	27
90-100	4	4
100-110	0	2

In Table 4.5, the pulse rate of the elderly obtained before being given the intervention is 50-69 x/min for 4 people, 70-89 x/min for 25 people, and 90-100 x/min for 4 people. After being given an intervention of 70-89 x/minute for 27 people, 90-100 x/minute for 4 people, and 100-110 x/minute for 2 people.

**Table 6. Normality Test**

	Shapiro-wilk		
	Statistic	df	Sig
Systolic blood pressure pretest	.907	33	.008
Post-test systolic blood pressure	.963	33	.315

Diastolic blood pressure pretest	.871	33	.001
Post-test diastolic blood pressure	.923	33	.022
Pulse pretest	.956	33	.202
Pulse post-test	.923	33	.022

Based on the results of the normality test using the saphiro-wilk test conducted by the researcher, it was found that the data owned by the researcher 2 was normally distributed, and 4 was not distributed normally. Therefore, it is not possible to carry out a paired t-test because the requirements for paired t-tests are *normally distributed pretest and post-test* data.

**Table 7. Wilcoxon Test**

Wilcoxon Test	Systolic blood pressure	Diastolic blood pressure	Pulse
P-value	.005	.010	.000

In the Wilcoxon test, systolic blood pressure was found to have a p value of 0.005, diastolic blood pressure was found to have a p value of 0.010, and pulse rate was found to have a p value of 0.000. In the Wilcoxon test, it is said to have an effect if the value of  $p < 0.05$ . This means that there is a significant effect of low-impact aerobic exercise for 8 weeks on systolic blood pressure, diastolic blood pressure and pulse rate in the elderly at the Tresna Werdha Abdi Binjai Nursing Home.

## DISCUSSION

In Table 1, the most elderly people are the elderly with an age range of 60-70 years, with a total of 66.7% or as many as 22 people. This is in accordance with data

released by the Ministry of Home Affairs (Kemendagri) in 2021, stating that the elderly group aged 60 to 69 years in Indonesia dominates with a total of approximately 17 million people. The central statistics agency also said the same thing, that the percentage of the elderly in Indonesia is dominated by the elderly group aged 60 to 69 years, whose percentage reaches up to 63.82% of the total number of elderly people, reaching 25.66 million elderly people in Indonesia.<sup>7,8</sup>

In Table 2, the gender of the elderly is obtained. In this study, the data of the elderly with the female gender is more than the elderly with the male sex, which is only half of the number of the elderly female sample. This is in accordance with data issued by Susesnas in 2020, which states that the number of elderly women is greater (14.13%) than the number of elderly men (5.06%).<sup>9</sup> This incident occurs because women have a higher life expectancy than men. The World Health Organisation also said that women's life expectancy is higher than that of men,<sup>10</sup>

In Table 3, it is found that the systolic blood pressure of the elderly decreased after doing low-impact aerobic exercise, which can be seen in the data on the systolic blood pressure, which is 120-139 mmHg before exercise for 23 people, and after exercise for 13 people. This is in line with the research of Revansia Missi and Arina Maliya in Wironanggan Village, Gatak Sukoharjo District, in 2017, which found that there was a decrease in the average systolic blood

pressure in the elderly from 154 mmHg to 142 mmHg after doing aerobic exercise and ergonomic gymnastics.<sup>11</sup> In line with Lina Indrawati's research on hypertension patients at the Jatiasih Bekasi health centre in 2018, it was found that there was an average decrease in systolic blood pressure from 160.67 mmHg to 139.17 mmHg after doing aerobic gymnastics.<sup>12</sup> This is also in accordance with the research of Ririn Damayanti and Noortje Anita in Brongkos Hamlet, Kesamben, Blitar, in 2020, found that there was an average decrease in systolic blood pressure from 167 mmHg to 135 mmHg after doing aerobic gymnastics.<sup>13</sup>

In table 4, it is found that the diastolic blood pressure of the elderly decreased after doing low impact aerobic exercise, which can be seen from the data on the most diastolic blood pressure before being given the intervention, which was 80-90 mmHg for 23 people, after being given the most diastolic blood pressure intervention, which was 70-79 mmHg for 18 people. This is in line with the research of Iswarabhuwana et al. in Pikat Village, Klungkung, where it was found that there was a decrease in the average diastolic blood pressure from 93.07 mmHg to 76.15 mmHg after doing elderly gymnastics.<sup>14</sup> In line with Mariza Elvira's research at the Tresna Werdha Hall of Maternal Affection at the Batusangkar Social Home, it was found that there was a decrease in diastolic blood pressure in the elderly with a mild hypertension scale from 8 people to 7 people after doing yoga gymnastics activities.<sup>15</sup> This is also in

accordance with a study conducted by Moa Wolff et al. at the Svedala Primary Health Service Centre in Sweden found a decrease in the average diastolic blood pressure from 88.4 mmHg to 84.7 mmHg after doing yoga activities at home.<sup>16</sup>

In Table 5, it is found that the pulse rate of the elderly increases after doing low-impact aerobic exercise, which can be seen from the data of the highest pulse rate, which is 70-89 x/minute before exercise for 25 people, and after exercise, it becomes 27 people. This is in line with the research of Rezki Amelia and Hakim at the Wredha Tresna Abiyoso Nursing Home in Yogyakarta found an increase in the average pulse rate from 66 times per minute to 75 times per minute after doing ergonomic gymnastics for 4 weeks<sup>17</sup>. In line with the research of Syarifah Zahra et al. on PJKR UNWAHAS students, it was found that there was an increase in pulse rate marked by data *ranging* from 53-93 times per minute to 71 people before exercising, after exercising a *range* of 65-100 times per minute to 57 people and followed by a *range* of 101-120 times per minute totaling 14 people.<sup>18</sup>

In Table 7, the Wilcoxon test of blood pressure, both systolic and diastolic, and pulse rate, with p-values of 0.005, 0.010, and 0.000. This proves that there is a significant effect of low-impact aerobic exercise for 8 weeks on blood pressure, both systolic and diastolic, and the pulse rate of the elderly. This is in accordance with research by Ellis Makawekes et al in 2020 in Taloarane Village, Manganitu District, a significant

influence was found between physical activity on blood pressure in the elderly, with a p-value: 0.000.<sup>19</sup> In line with Ethyca Sari's research in 2021 at the Tresna Werdha Hargo Dedali Nursing Home Surabaya, a significant influence was found between cardiac exercise on blood pressure in the elderly, with a p-value: 0.000.<sup>20</sup> This is also in accordance with the research of Benny Bradley and Khairunnisa Berawi in 2016 found a significant effect between heart exercises on the pulse rate of the elderly with p-value = 0.04.<sup>21</sup> In line with the research of Syahria Arya et al., a significant effect was found between jogging on the average pulse rate, with a p-value: 0.000.<sup>22</sup>

The results of this study show that there is a significant relationship between low-impact aerobic exercise on blood pressure, both systolic and diastolic, and pulse. Low-impact aerobic exercise can affect systolic blood pressure, diastolic pressure and pulse rate in the elderly. Exercise has many benefits in controlling blood pressure. If this exercise is done regularly, it can have a good effect on the elderly, namely, it can increase permeability in blood vessels. This is due to a decrease in the work of *sympathetic activities* and an increase in parasympathetic activity in the cardiovascular system. Decreased work *sympathetic activities* can cause a decrease in hormone receptors, and hormonal function that causes blood vessels to relax and vasodilate so that it can decrease *cardiac output*, increase blood filling in the veins and lose exercise-related plasma volume, this

can result in a reduction in central venous pressure and heart filling pressure which can lead to a decrease in blood pressure and Return to normal within 60-120 minutes.<sup>23,24</sup>

## CONCLUSION

In this study, the characteristics of most respondents were obtained with an age range of 60-64, of 39.4% (13 people).

1. Respondents who had been given the intervention were found to have decreased systolic blood pressure, where systolic blood pressure data of 120-139 mmHg was found for 13 people, whereas data before the intervention showed systolic blood pressure of 120-139 mmHg for as many as 23 people.
2. Respondents who had been given the intervention were found to have decreased diastolic blood pressure, where data on diastolic blood pressure of 70-79 mmHg were found for 18 people, and data before being given the intervention on diastolic blood pressure of 80-90 mmHg were found for 23 people.
3. Respondents who have been given intervention were found to have an increase in the pulse rate of the elderly, where there was a pulse rate of 70-89 x/minute, which was 27 people, whereas the data before being given intervention on the pulse of 70-89 x/minute was 25 people.

4. There was a significant effect of 8 weeks of *low-impact* aerobic exercise on blood pressure, both systolic, diastolic, and pulse, in the elderly. (The value of *p-value* <0.05).

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